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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/730,199	12/05/2000	Donald J. Kerfeld	10247US01	7264

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Attention: Eric D. Levinson
Imation Corp.
Legal Affairs
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EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/730,199	KERFELD ET AL.	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-17 and 21-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-17 and 21-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment/arguments dated 05/20/2004. Applicant's amendment to the claims coupled with their argument is considered to be persuasive in overcoming all of the previously applied claim rejections. Accordingly, these rejections are withdrawn. However, the amendment/arguments do not render the case allowable in view of the new grounds of rejection set forth below.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-6, 11-17, 21-28, 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US5202880) in view of Lewis et al. (US4519065), Davis (WO00/48172), and Ueda et al. (US5481530)

4. Claim 1 requires a data storage medium comprising a first layer comprising a substrate, a second layer including a photopolymer, the second layer exhibiting surface variations, and a third layer comprising a thin film stack of a plurality of sub-layers that together form a magnetic recording structure, the thin film stack of the third underlayer including an underlay to improve growth of microstructures of the sublayers of the thin film stack during fabrication, a magnetic recording material, and a hard coat, wherein each of the sublayers of

the thin film stack substantially conforms to the surface variations of the second layer, and wherein the third layer including the thin film stack forms a substantially continuous layer over the surface variations.

5. With respect to these limitations, Lee et al. (Lee) teaches a recording medium comprising a substrate 110, a reflective layer 120 on the substrate, a dielectric layer 130 on the reflective layer 120, a recording layer 140 on the dielectric layer 130, and a protective layer 150 on the recording layer 140 (figure 4 and column 7, line 48-column 8, line 30). The recording and protective layers of Lee are considered to be equivalent to applicants claimed recording and protective layers respectfully.

6. Regarding the substrate, Lee teaches that the substrate is suitably made from a variety of materials, such as polycarbonate, "2p" substrates, glass, or aluminum (Column 6, lines 60-68). The examiner notes that 2p substrates for recording media are well known to consist of a support (i.e. glass) having a photopolymer layer formed thereon. This is evidenced by Ueda et al. (US5481530, column 5, lines 13-15).

7. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a 2p substrate comprising a glass base coated with a photopolymer as the substrate in the invention taught by Lee, as Lee recognizes the equivalence of 2p type substrates to the other types of substrate listed as suitable. One would specifically chose a glass base in view of the specific teaching in Ueda that 2p substrate comprising a glass base and a

photopolymer coating are suitable for use as a disk shaped recording media substrate.

8. Bearing the above in mind, the examiner notes that Lee specifically teaches that the substrate has a plurality of depressions formed in its surface (see figure 4). It is the examiners position that a 2p substrate having grooves in its surface is equivalent to applicant's claimed first layer and second layer containing a photopolymer having surface variations.

9. Regarding the underlay. Lee does not teach the use of an underlay to improve the growth of microstructures of the sublayers of the thin film stack. However, Lee does teach that the reflective layer is suitably formed from aluminum, and is designed to reflect light back through the recording layer (column 7, lines 58-65).

10. Bearing the above in mind, Lewis a recording medium that utilizes a reflective layer for the purpose of reflecting light. Suitable materials for forming this layer include Al, Cr, Fe, Sn, In, Ag, Au, and alloys thereof (column 14, lines 27-39). Further, Davis teaches a magneto-optical storage disc that is manufactured by placing a magneto-optical storage layer between a reflective metal layer and a protective layer (page 29, lines 10-15 and figure 20) Suitable materials for the reflective layer include any material capable of reflecting an incoming energy field (i.e. light or a magnetic field), such as Al, Ag, Au, and Ti (page 28, lines 11-26).

11. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize an alloy of Cr as the reflective layer in Lee.

12. One would have been motivated to make this modification in view of the fact that the prior art recognizes the equivalency of Cr alloys to Al as materials that are equivalent for use as a reflecting layer.

13. Though the examiner acknowledges that none of the above cited references specifically teach that a Cr alloy reflecting layer will function to improve microcrystalline growth as required by claim 1, the examiner takes the position that this limitation is met by the Cr alloy reflecting layer utilized by Lee as modified by Lewis, Davis, and Ueda. First, chrome alloy is listed in claim 21 as a suitable material for forming the underlayer. In view of the similarity between the material claimed in claim 21 and that utilized by Lee as modified by Lewis, Davis, and Ueda, the examiner takes the position that the claimed function is met. Should applicant t traverse this argument, the examiner notes that it is widely established in the art of magnetic recording media that layers formed of Cr based alloys are well known to impact the microcrystalline growth of layers that are sputter/vapor deposited on them. All of the layers deposited on the reflecting layer in Lee are either sputter or vapor deposited (see column 7, lines 49-60 of Lee). Thus, the examiner takes the position that the applicants claimed function is met when a Cr alloy reflective layer is utilized.

14. Claim 3 requires a disk shaped substrate. Lee specifically teaches this limitation a column 7, lines 5-15.

15. Claim 4, requires the first layer to provide rigidity and mechanical stability to the medium. As the applicant has not defined a specific level of rigidity or mechanical stability, any layer having any level of rigidity or mechanical stability reads on this limitation. Thus, the base of the 2p substrate utilized by Lee as modified by Lewis, Davis, and Ueda is considered to meet applicants claim 4 limitations.

16. Claim 5 requires the first layer to comprise glass, aluminum, Al-MG alloy, ceramic, or plastic. This limitation is met as set forth above for claim 1.

17. Claim 6 is met as set forth above for claim 1.

18. The limitations of claims 11-14 are met as set forth above for claim 1.

19. Claim 15 requires the surface variation to contain a servo pattern. Davis teaches a data storage medium that utilizes a polymer layer having surface features such as bumps, pits and grooves. Such features can be utilized for servo patterning, which is well known in the art of storage media to provide a read back signal that allows a read out mechanism such as a head to know its position relative to a track on the disc (page 19, lines 10-20). The depth of the pits/grooves/bumps utilized for this purpose is typically 10nm-150nm.

20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a servo pattern from the embossed pattern of Lee as modified by Lewis, Davis, and Ueda. Further, it would have been obvious to one of ordinary skill in the art to control the depth of the pits/grooves/bumps taught by Lee as modified by Lewis, Davis, and Ueda to 10nm.

21. One would have been motivated to make this modification in view of the fact that Lee teaches a substrate having pits/grooves/bumps, because Davis teaches that embossed features such as pits, bumps and grooves can be utilized to form a servo pattern, which is well known in the art to provide positional information to a read out mechanism such as a head. One would have been motivated to control the depth to 10nm in view of the teaching in Davis that 10nm deep features on a substrate are suitable for forming an accurately readable servo pattern (see page 24, lines 11-20).

22. The limitations of claims 16-17 are met as set forth above for claim 15.

23. Claim 21 is met as set forth above for claim 1.

24. Claim 22 requires the protective layer to comprise carbon, nitrogenated carbon, or hydrogenated carbon. Lee does not teach the use of a diamond like carbon layer as the protective layer. However, Lee does teach that nitrides such as Silicon Nitride are suitable for use as the protective layer (column 8, lines 28-50).

25. Bearing this in mind, Davis teaches various materials that are suitable for use as a protective layer on the recording layer of a magneto-optical recording medium. Specifically, Davis teaches that nitrides such as Silicon Nitride, carbon films such as diamond like carbon, and oxide films as silicon oxide are suitable (page 27, lines 15-21).

26. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize diamond like carbon as the protective layer in Lee, as the prior art recognizes the equivalence of Diamond Like Carbon

to Silicon Nitride as a suitable material for forming a protective layer in a magneto-optical recording medium.

27. Claim 23 requires the third layer to further include a buffer. The examiner takes the position that the dielectric layer 130 of Lee is equivalent to applicants claimed buffer.

28. Claims 24 and 25 require the medium to comprise a fourth layer substantially conforming to the surface variations, wherein the fourth layer is a lubricant. Though Lee does not teach the use of a lubricant layer conforming to the surface variation, Lee does mention in the background that lubricant layers are typically applied to the outer surfaces of magneto-optical recording media (column 2, lines 55-65). Further Davis teaches that additional layers such as a layer of lubricant are adventitiously applied over data storage and reflective layers that are formed over embossed polymer layers (page 28, lines 1-10). Further, Davis teaches that the lubricant layer may be applied via conventional means, i.e. sputtering, chemical vapor deposition, plasma enhanced CVD, etc... As shown in Lee, lubricant layers are useful for reducing wear and tear on a recording medium (column 2, lines 55-69).

29. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a sputter/vapor deposited lubricant layer over the surface of the protective layer utilized in Lee as modified by Lewis, Davis, and Ueda. One would have been motivated to make this modification in view of the teaching in Davis that lubricant layers are suitably formed over

protective layers in magneto-optical recording media and in view of the teaching in Lee that lubricant layers reduce wear and tear on the media.

30. While none of the above-cited references teach that the lubricant layer substantially conforms to the surface of the surface variations as required by claims 24-25, the examiner takes the position that this limitation is met when a sputter/vapor deposited layer is utilized. This is due to the fact that Lee shows that sputter/vapor deposited layers (i.e. the reflecting, recording, and protective layers) conform to the surface of the variations on the substrate.

31. Claim 26 requires the medium to be flyable. Though this feature is not disclosed by the references, given the similarity in structure between the cited art and the claimed invention the examiner takes the position that this limitation is met.

32. Regarding claim 27, wherein the applicant requires a substantially rigid substrate, a photopolymer containing surface variations, a thin film stack and comprising a plurality of sublayers that together form a magnetic recording structure, the thin film stack including an underlayer to improve growth of microstructures of the sublayers of the thin film stack during fabrication, a magnetic recording layer substantially conforming to the surface variations, and hardcoat substantially conforming to the surface variations, and a lubricant substantially conforming to the surface variations, wherein the surface variations are arranged to define a topology which creates detectable changes in ambient conditions as a transducer flies over the data storage medium. The examiner takes the position that these limitations are met as set forth above for claims 1,

15, 21, and 25 above. As discussed above, the combination of Lee as modified by Lewis, Davis, and Ueda meets all of the structural limitations of claim 27. Regarding the requirement that the surface variations for a topology that creates detectable changes in ambient conditions as a transducer flies over the data storage medium. The examiner takes the position that this limitation is met when the variations in the surface of the substrate taught by Lee as modified by Lewis, Davis, and Ueda are arranged so as to form a servo tracking pattern.

33. Claim 28 requires the same limitations as claim 27 aside from requiring the substrate to be "flexible" As no level of flexibility for the substrate is required, any substrate can be construed as "flexible" to some degree. Thus, the substrate of Lee as modified by Lewis, Davis, and Ueda meets this requirement.

34. Claim 30 requires essentially the same limitations as claim 27, except that it requires the presence of first and second data storage layers, wherein the second data storage layer includes a photopolymer material. Lee teaches the formation of a double sided medium having a patterned 2p substrate (substrate having a photocurable polymer formed on the surfaces thereof; equivalent to applicants claimed substrate and photopolymer layer), a reflecting layer (equivalent to applicants claimed underlayer) of Cr on each side of the 2p substrate, a dielectric layer on both Cr layers, and magnetic layer on each dielectric layer, and a protective layer on each magnetic recording layer. The magnetic layer on one side of the substrate is considered to be equivalent to applicants claimed first data storage layer. Either one of the photopolymer layers is considered to be equivalent to applicants second data storage layer. The other

magnetic layer is considered to be equivalent to applicants magnetic recording layer. The obviousness of forming a lubricant over the protective layers of Lee is set forth above. The requirement that the surface variations define a topology which creates detectable features is met as set forth above for claim 28.

35. Claim 31 requires a removable hard disk unit including a data storage medium having all of the limitations of claim 1, a housing, and a flying head transducer. Lee teaches the medium as set forth above for claim 1. Lee teaches a data storage system (equivalent to applicants claimed hard disk) utilizing this medium and including a housing and a flying head transducer (see figure 1 and column 4, line 30-column 5, line 38).

36. Claim 32 is met as set forth above for claim 31.

37. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee as modified by Lewis, Davis, and Ueda as applied to claim 1 above, and further in view of Anderson et al. (US4304806).

38. Lee as modified by Lewis, Davis, and Ueda does not teach that the photopolymer comprises at least 30% by weight of radiation polymerizable components selected from epoxy-terminated silanes, as required by claim 7. However, it is noted that Lewis teaches that the preformatted substrate can be formed via molding or contact printing (column 6, lines 60-65)

39. Further, Anderson et al. (hereafter Anderson), teaches an information carrying element that comprises a substrate formed from a glass, polymers, ceramics, or metallic material, wherein the substrate is coated with a polymer

layer that comprises at least 30% epoxy terminated silanes, wherein the polymer layer is further coated with a reflective layer (column 3, lines 20-65, column 4, lines 3-9 and column 2, lines 1-2). Anderson utilizes light sensitive catalysts to polymerize the epoxy-terminated silanes (column 4, lines 58-62), thus it is clear that these materials are photo polymerizable. Further, Anderson teaches that these epoxy-terminated silanes exhibit good abrasion resistance, and can be manufactured utilizing low temperature and pressure with non-metallic stampers and masters (column 5, lines 1-5 and 58-61).

40. Therefore it would have been obvious to one with ordinary skill in the art to utilize the epoxy terminated silane polymer disclosed by Anderson as the photocurable polymer layer utilized in the 2p substrate of Lee as modified by Lewis, Davis, and Ueda.

41. One would have been motivated to make this modification in view of the fact that Lee teaches that the preformatted substrate can be made via molding or contact printing, and the teaching in Anderson that media utilizing epoxy terminated silanes as an embossed polymer layer exhibit good abrasion resistance and can be made at low temperature and pressure via non-metallic stampers and masters.

42. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee as modified by Lewis, Davis, and Ueda as applied to claim 1 above, and further in view of Kirino et al. (US5703855).

43. Lee as modified by Lewis, Davis, and Ueda does not teach that the surface variations are machine readable patterns that define at least one bit pitch of approximately 200nm, as required by claim 8.

44. However, Kirino teaches that by controlling the bit pitch (known to be the spacing of optically detectable features (usually marks such as pits or grooves)) of a recording medium, the recording density of the recording medium is controlled, with smaller bit pitch corresponding to increased recording density (column 1, lines 5-37). Thus, the examiner takes the position that the bit pitch of the recording medium taught by Lee as modified by Lewis, Davis, and Ueda is a results effective variable.

45. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the bit pitch of the recording medium of Lee as modified by Lewis, Davis, and Ueda to a desired level so as to achieve a recording medium having a desired recording density.

46. Claims 9 and 10 are met as set forth above for claims 8 and 1. The pattern disclosed by Lee is accurately described as a pattern of data bumps. When the pattern forms a servo signal, it contains encoded data.

Allowable Subject Matter

47. Claim 29 is allowed.

48. The following is a statement of reasons for the indication of allowable subject matter: The closest prior art to that of the instantly claimed invention is US Patent 5202880 to Lee et al. in view of WO00/48172 to Davis, and

US5418530 to Ueda. These references in combination teach a data storage medium having a substrate, a photopolymer on the substrate, a reflective layer on the photopolymer layer, a dielectric layer on the reflective layer, and a magnetic layer on the dielectric layer. All of the layers, including the substrate, are patterned with optically detectable features. However, these references alone or in combination do not teach a data storage medium having substrate containing optically detectable features, and a reflective layer for facilitating the optical detection of the optically detectable features in the substrate via reflection of an optical signal; wherein the photopolymer has surface variations and is formed over the reflective layer, as required by claim 29.

49. There is no teaching in the prior art that would motivate one of ordinary skill in the art at the time the invention was made to modify the prior art so as to arrive at the invention claimed by claim 29. Specifically, there is no teaching in the prior art that would motivate one of ordinary skill in the art at the time the invention was made to place a photopolymer layer having surface variations over a reflective layer that facilitates the detection of optically detectable features in a transparent plastic substrate.

Response to Arguments

50. Applicant's arguments with respect to claims 1, 3-17, and 21-32 have been considered but are moot in view of the new ground(s) of rejection. For clarity, all of applicant's arguments are directed towards grounds of rejection that are no longer applied. These arguments are moot with respect to the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 571-272-1517. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 571-272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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D. S. NAKARANI
PRIMARY EXAMINER